

Customized Tricycle for Patient with Disabilities

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Abstract: Mobility of physically disabled persons is a concerning social issue nowadays. The basic Tricycle is a three-wheeled design, pedaled by disabled persons in the side and seat in the middle for sitting arrangement. They use only one hand to steer the handle because other-hand is used to rotate the pedal. Our aim is to design a low-cost tricycle that will allow person to accelerate and steer the tricycle from a single place. The way the Bike Chair works is the back is essentially a regular bicycle, but the front turns it into a tricycle, and sort-of makes it a wheelchair and bicycle combo. The disabled passenger sits on the front two wheels, as the driver uses their front wheels to steer the bike. The passenger has buckles and strap to secure the min place and top even them from falling out of the chair during the bike-ride. Furthermore, the tricycle's compact size, maneuverability, and zero emissions make it an attractive option for reducing traffic congestion and pollution in densely populated urban areas. Future research directions include optimization of battery and motor technologies for enhanced performance and efficiency, as well as integration of smart features for improved user experience and safety.

Keywords: Customized tricycle, Easy foldable, Battery powered vehicle, Portable.

I. INTRODUCTION

A disability is defined as a condition or function judged to be significantly impaired relative to the usual standard of an individual or group. Disability may include impairments, limitations in performing the activities, and participation constraints. Disability is principally caused by the impairments of various subsystems of the body which can be classified in physical disability and mobility impairments. Many difficulties are involved with the mobility of the physically challenged individuals within the society. It can be seen that physically disabled people essentially use some helpful devices like artificial limbs or legs, wheel chairs, three wheeler, etc. for transportation. But these wheel chairs or three wheeler that are generally used by Indians are crude or are inefficient in design; not considerably appropriate for the country like India. It is so because generally found manually operated wheel chair has a basic drawback that the user has to apply physical force to turn the wheels. This type of action is physically strenuous and may end up in muscle and joint pain and degradation, carpal tunnel syndrome and torn rotor cuffs; that may result in secondary injury or any other disability.

II. STRUCTURE DESIGN

Since balancing ability of elderly is poor so we have designed tricycle, it has a single wheel at the front and two wheels at the back side making it balance for the patients. The motor-based tricycle has an accelerating throttle which is used to control the speed of the vehicle; the motor can also be operated at the reversible mode for easy moving of patients. The front single wheel is attached with the handlebar along with the throttle which is used to change the direction of the wheel and the brake system is also attached with it.

Each of the back wheels is equipped with a set of disk brakes, which are actuated with a double-pull brake lever on the handlebars. Comfortable seating is important, especially for longer rides. The design should accommodate the rider's size and provide adequate support. Additional safety features such as lights, reflectors, and horns should be integrated into the design to enhance visibility and alert other road users. If the tricycle is intended for individuals with mobility challenges, accessibility features such as low step-through frames. The battery pack should be strategically placed for optimal weight distribution and balance. It's often located low in the frame to keep the center of gravity low, enhancing stability. The motor should be securely mounted to the frame, typically in the rear wheel hub or the frame itself. The mounting should withstand vibrations and provide efficient power transfer. The direction of the tricycle is determined by the angle at which the front wheel(s) are turned. As the rider applies force to the steering mechanism, the tricycle responds by turning in the corresponding direction. This allows the rider to navigate corners, intersections, and obstacles while controlling the direction of travel.

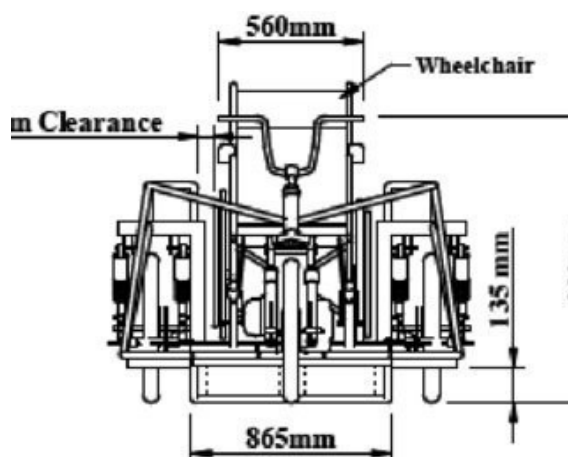


Fig1: Model of Wheelchair Front and rear lights for visibility and safety, especially in low-light conditions.

III. COMPONENTS

BLDC MOTOR

A permanent magnet synchronous electric motor which is driven by direct current (DC) electricity and it accomplishes electronically controlled commutation system. It is based on the interaction between the magnetic fields of the stator and the rotor. The stator produces a rotating magnetic field, which interacts with the permanent magnets on the rotor, producing a torque that causes the rotor to rotate.

LITHIUM-ION BATTERY



Lithium-ion batteries are the core of the electric vehicle revolution. It has a high energy efficiency, good high-temperature performance, longlife and low self-discharge. They can be recharged many times over, which is essential for use in electric vehicles that require extensive charge/recharge cycles over their life.

THROTTLE



The throttle is used to regulate power output of the motor. It is also used to drive the opening and closing of throttle valve which can improve vehicle durability, fuel economy and emissions.

It works similarly as the wheels of bicycles but with motor and battery it provides extra power to the rider. The motor is located on the rear wheel and the battery is typically stored in the compartment under the seat.



Fig2: Components

ELECTRIC KEY SWITCH

The switch has the electric contact that makes or break the circuit connections. These contacts are controlled by the position of key. When the key is turned to the 'on' position, the contacts close, allowing the electric current to flow. In the 'off' position, the contacts open, interrupting the current.

BRAKING SYSTEM

Braking systems on e-trikes can vary, but they typically include mechanical disc brakes or hydraulic disc brakes for reliable stopping power. Some models may also feature regenerative braking, which helps recharge the battery while slowing down.

DISPLAY AND CONTROL

A control panel or display mounted on the handlebars allows the rider to monitor important information such as battery level, speed, and distance traveled. It may also include controls for adjusting power settings or activating lights and other accessories.

LIGHT AND ACCESSORIES

Like traditional bicycles, electric tricycles may have integrated lights for visibility and safety, as well as additional accessories such as fenders, racks, and baskets for carrying cargo. The working of a battery-powered tricycle involves several key steps that allow it to convert electrical energy stored in the battery into mechanical energy to propel the vehicle forward. Overall, the working of a battery-powered tricycle involves the seamless integration of electrical and mechanical components to provide an efficient and environmentally friendly mode of transportation.

IV. COMPONENTS SPECIFICATION

| S.No | NAME OF COMPONENT | MATERIAL | DIMENSION |
|------|-------------------|---------------|-----------|
| 1. | FRONT WHEEL | STEEL, RUBBER | 8" |
| 2. | BACK WHEEL | STEEL, RUBBER | 8" |
| 3. | THROTTLE | | --- |
| 4. | ROD | MILD STEEL | --- |
| 5. | SEAT | STEEL | 16"17"16" |
| 6. | BRAKE WIRE | STEEL, RUBBER | --- |
| 7. | BEARING | STEEL | --- |
| 8. | COUPLING | STEEL | --- |

V. LITERATURE SURVEY

1. Daniel Dourte, et.al described in his paper about the development "ELECTRIC TRICYCLE" The aim of this project is to add an electric power train and control system to the current hand-powered tricycle to provide tricycle users with improved levels of mobility. The design objectives required a simple and affordable design for the power train and controls, a design that needed to be reliable, sustainable, and functional.

- II. Ajit Mohekar, et.al described on his paper about the development “RETROFITTED TRICYCLE” He designed a retrofitted tricycle by modifying the existing scooter.
- III. He also designs special platform arrangement so a wheelchair occupant can easily hold or leave the tricycle. This trike can be used for a long distance making it suitable for long journey.
- IV. Jayaprakhar et.al described on his paper about the development “BATTERY POWERED VEHICLE”. She proposed an innovative design of battery powered vehicle. Vehicle equipped with three wheels at rear and one at front. Power is given to the rear middle wheel and remaining rear two wheels are for support, accommodate the suspension. In spite of all this feature it was sophisticated design due to extra wheel.
- V. Abdulkadir Baba Hassan et.al described in his paper about the development “DESIGN AND FABRICATION OF A MOTORIZED PROTOTYPE TRICYCLE FOR THE DISABLE PERSONS” This project design is embodied on a motorized tricycle for disabled Persons. The tricycle was specifically designed to suit wheelchair occupants of healthy Upper torso with pelvic to foot restraint. It is also designed to suit a commonly available Wheel chair. The level of relationship between the disabled people in the society has highly being jeopardized; therefore, this project was designed to correct the difficulties in mobility of the wheelchair users. The main aim of the project design is to ease mobility for the physically challenged and also provide adequate comfort they desire.
- VI. Samugam, et.al described in his paper about the development “DEVELOPMENT OF BATTERY POWERED TRICYCLE” The main purpose of this project is to develop a battery powered electric motor tricycle which can be used as a simple transportation and for economy reasons, to develop a battery powered electric motor tricycle which can be used as a simple transportation and for economy reasons. A motorized tricycle is a three wheeled tricycle with an attached motor used to assist with pedaling. handicapped is the mobility vehicle. The fact that they are no longer depending on someone else to perform daily duties is a big step forward. On the journey to mobility and freedom, motorized scooters and tricycles are the tools to finish that journey
- VII. Shuh Jing Ying, et.al [8] described in his paper about the development “POWER ASSIST HAND TRICYCLE WITH BATTERY FOR DISABLED PERSONS” A hand tricycle is originally designed to be used by a disabled person with lower extremity weakness but with power in his or her hands and arms. This tricycle is modified by the addition of an electric motor and battery to help power the vehicle. The functions of the original design are not altered. The battery, motor, speed reducer and clutch are properly arranged.

VI. PROBLEM IDENTIFICATION

At this situation it is very hard to travel one place to another for physically handicap people. Alone they cannot be travel anywhere they need help of normal people to travel. So, we want to overcome this situation. By making motor based tricycle at an optimal cost. So that physically handicap people can afford this vehicle and live life easy and productive.

VII. CONCLUSION

In our project we utilized motor mechanisms for operating tricycle hence it is most useful and economical as compared to the other tricycle. This tricycle is made of material which is available easily in the market. This tricycles mostly useful for elder and handicapped people. it is simple in design and easy to operate. The efforts made for operating tricycle is less this is an advantage of this tricycle. The tricycle cost is less as compared to other tricycle. Even in rehabilitation, hand cycling design and fitting for different user groups. Apart from optimizing the wheelchair user interface, one needs to carefully consider maximizing overall work capacity of users and further reduction of the vehicle mechanical losses to ensure a real optimum level of mobility.

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